

# Teen Riskiness During a Global Pandemic: A COVID-19 Case Study

Ereni Delis<sup>1</sup> and Candace Thomas<sup>#</sup>

<sup>1</sup>Hillsdale High School, San Mateo, CA, USA

<sup>#</sup>Advisor

## ABSTRACT

Adolescent risk-taking is a normal part of human development. However, it's this very behavior that leads to teen fatalities, poor mental health, and other unfortunate consequences. Societal changes, such as the pervasiveness of social media in the last two decades, have led to increases in risk-taking behaviors such as drug and alcohol use, sexual risk-taking, violence, and more. This beckons the question of how adolescents' risk-taking behaviors are impacted, if at all, when other pervasive mediums or stress-inducing events are introduced into their lives —such as a global pandemic. This present research used COVID-19 as a case study and sought to address the relationship between teen risks prior to and during the pandemic. This investigation examined teen engagement in baseline risk-assessments, such as cheating on school assignments or tests, underage drinking, and nicotine product use, and COVID-19 risk. COVID-19 risky behaviors included exposing oneself to potentially unsafe contacts — in other words not adhering to social distancing guidelines. COVID-19 risky mindset measurements included perceived COVID-19 health risk ratings and responses to engagement in COVID-19 risky activity hypotheticals. Factors such as familial average income and gender were included in the analysis. Findings suggest positive relationships between engagement in baseline risk-assessments and both riskier COVID-19 behaviors and mindset.

## **Introduction**

Adolescents have a biological disposition to be risky due to the discrepancy in development between the prefrontal cortex, the decision-making part of the brain, and the limbic system, the emotion-oriented part of the brain (Steinberg, 2015). It's been established that this discrepancy in development instigates poor decision-making, particularly riskier decisions than other age groups (Romeo, 2013). As a result of this risk-oriented mindset, teenagers are more prone to fatalities, with an adolescent mortality rate over triple that of middle school students.

Research suggests that the brain composition of an adolescent leads to increased vulnerability to impaired driving, drug addiction, unprotected sex, and environmental stressors (e.g., Arain et al., 2013). Environmental stressors can be defined as a serious state of societal or global affairs, whether it be war, famine, or pandemic. This teen vulnerability raises the question of whether or not adolescents in today's society, and specifically their behaviors, are affected at all by current environmental stressors (e.g., Johnson et al., 2012). Prior research demonstrates that there is an association between environmental stressors, like natural disasters and increased adolescent risk-taking (e.g., Racz et al., 2011).

The present examination of adolescent risk-taking behaviors in this study pertains to the current environmental stressor — the COVID-19 pandemic. This paper aims to address the relationship between engagement in adolescent risk-taking behaviors before as opposed to during the pandemic. The question this study sought to address was whether or not adolescent risk-taking engagement increased, decreased, or remained the same throughout the change in environment.

This study took place during the period of greatest social isolation of the pandemic, when CA Governor Newsom mandated the stay-at-home order in September of 2020. At this point, there was no vaccine available.

### **Main Hypotheses:**

1. After accounting for pre-pandemic risk assessments, current social-distancing measures, COVID-19 risk-taking hypotheticals, residence location, and gender, adolescent engagement in baseline risk-taking measures (i.e. cheating on school tests or assignments, underage drinking, or using nicotine products) will be positively and significantly related to a greater likelihood of engaging in risky COVID-19 hypothetical activities.
2. After accounting for pre-pandemic risk assessments, current social-distancing measures, COVID-19 risk-taking hypotheticals, residence location, and gender, adolescent engagement in baseline risk-taking measures (i.e. cheating on school tests or assignments, underage drinking, or using nicotine products) will positively predict the number of potentially unsafe in-person interactions during the government mandated stay-at-home order.

### **Supplemental Hypotheses:**

1. There will be a significant difference in the mean rating of perceived COVID-19 adolescent health risks, on a scale from 1-10, between males and females.
2. Consistent with prior research (e.g., Racz et al., 2011), adolescents living in affluent residential neighborhoods will engage in a similar level of potentially unsafe in-person interactions as teens living in low income areas, which will be greater than the average number of interactions of adolescents in the middle class.

## **Method**

### **Participants**

A total of 517 participants from Hillsdale High School were recruited through the cluster sampling method. Each advisory, which can be likened to a homeroom class, served as a cluster. Advisories are nearly equally distributed in gender, race, and other demographic markers. From this original pool, 21 students were excluded due to invalid survey response answers such as nonexistent zip-codes or failing to respond to survey questions altogether. The final sample consisted of 496 participants. Demographically, the sample was 53.8% female ( $n = 267$ ), 44.4% male ( $n = 220$ ), and 1.8% other ( $n = 9$ ). Any student who identified themselves outside of female and male selected the “other” option. One-hundred and twenty-one respondents indicated their ethnicity as Asian (24.4%), 193 as White (38.9%), 10 as Black or African American (2.0%), 107 as Hispanic or Latinx (21.6%), 1 as Native American (0.2%), 13 as Pacific Islander (2.6%), and 51 as Other (10.3%). The sample consisted of students from varied residential locations, spanning over 30 miles across the Bay Area from San Mateo to Oakland. A large majority of respondents, 68.1%, indicated they live in San Mateo ( $n = 338$ ) and 23.2% indicated they live in Foster City ( $n = 115$ ).

### **Design**

The study consisted of a survey, reviewed by the Stanford Challenge Success Center for bias and wording of questions. The survey was anonymous to protect respondents’ privacy and help reduce response bias. Seven statements within

the first three questions served as baseline (pre-pandemic) adolescent risk assessments, while ten statements in the remaining survey questions measured current adolescent risk assessments (during pandemic).

## Measures and Instruments

**Demographics (Table 1).** Respondents were first required to complete a brief section of the survey that gathered demographic information. These questions inquired about race, identified gender, and residence location.

**Table 1**  
*Demographics*

Characteristic	N = 496
<u>Gender</u>	
Male	220 (44.4%)
Female	267 (53.8%)
Other	9 (1.8%)
<u>Race</u>	
White	193 (38.9%)
Asian	121 (24.4%)
Black/African American	10 (2.0%)
Hispanic/Latinx	107 (21.6%)
Pacific Islander	13 (2.6%)
Native American	1 (0.2%)
Other	51 (10.3%)
<u>Residence Location</u>	
San Mateo	338 (68.1%)
Foster City	115 (23.2%)
Burlingame	5 (1.0%)
San Francisco	3 (0.6%)
Daly City	2 (0.4%)
Millbrae	2 (0.4%)
Oakland	1 (0.2%)
San Bruno	1 (0.2%)
Decline to State	29 (5.9%)

**History of risky behaviors.** To measure baseline riskiness levels for each adolescent, respondents were asked to indicate whether they engaged in either cheating, drinking, and/or nicotine product usage through a list of three statements and a “Yes” or “No” response choice (Korn, 2016).

**Adolescent COVID-19 perceived health risk.** To examine the respondents’ perspectives about a given adolescent’s perceived health risk should they contract COVID-19, a 10-point Likert scale was used (1 = “No risk at all”, 10 = “Extreme risk”). Also, to assess participants’ beliefs about the likelihood that they personally would contract the virus, respondents were asked to rate on a 7-point Likert scale from “Extremely unlikely” to “Extreme likely.”

**Self-reported adherence to social distancing.** To examine current adolescent risk-taking during pandemic times, respondents were asked to enter the total number of people they were not socially distancing from. This excluded household members. The phrase “not socially distancing from” was defined as either spending in-person time with others less than six feet apart or spending in-person time with others without masks.

**COVID-19 risk-taking assessment.** Following the completion of the prior questions, the adolescent respondents were asked to assume that wherever they live, COVID-19 restrictions are minimal and that the provided activities listed in the question were allowed. Adolescents were asked to rate their likelihood on a 7-point Likert scale, “Extremely unlikely” to “Extremely likely,” that they’d engage in the five provided activities (e.g., “Board a plane right now if you had free tickets to a location of your choice”).

## Procedure

The survey was administered on each participants’ individual device (no common devices could be used due to the California statewide issued COVID-19 restrictions). Survey participants received a message at the beginning of the survey detailing the ensured anonymity of responses and my plans to use their data to pursue research. Respondents were then presented three questions for basic demographic information beginning with identified race, then identified gender, and lastly, zip code of primary residence. Following this, participants were required to answer questions targeting baseline pre-pandemic risk assessments, COVID-19 perceived adolescent health risks, and current COVID-19 risk-taking assessment measures, respectively. Survey respondents did not receive any compensation (i.e. advisory course credit).

## Results

### Hypothesis 1

It was hypothesized that after examining pre-pandemic risk assessments, current social-distancing measures, COVID-19 risk-taking activity hypotheticals, residence location, and gender, adolescent engagement in baseline risk-taking measures will be positively and significantly related to a greater likeliness of engaging in risky COVID-19 hypothetical activities. Baseline risk measurements included binary student responses, yes or no, to statements about cheating on tests and/or school assignments, underage drinking, and use of nicotine products. COVID-19 hypotheticals refer to the five risky hypothetical activities (i.e. hosting an indoor party) that adolescents rated on a Likert scale, from “Extremely unlikely” to “Extremely likely” to engage in during the government mandated stay-at-home order. These activities were presented with an indicated assumption that COVID-19 restrictions were minimal and these activities were allowed. See Table 2. The risk level of these responses was determined by how likely each respondent was to engage in said activity, with adolescents indicating increased likeliness of engagement in each activity (i.e. extremely likely, moderately likely, slightly likely) considered as riskier.

Fifteen multinomial logistic regression models were used to examine whether each of the three baseline risk assessments were positively related to potential adolescent engagement in each of the five risky COVID-19 hypothetical activities. The standard alpha level  $\alpha = 0.05$  was used to determine statistical significance. All coefficients of logistic regression are positive. This reveals a positive relationship between engaging in any or all of the three baseline risks – cheating, underage drinking, and nicotine product usage — and feeling likely to engage in the five risky COVID-19 activities. The hypothesis is supported.

The strongest relationship presented was between engaging in underage drinking and feeling likely to board a plane if having free tickets to a location of their choice during the pandemic lockdown, with a coefficient of 1.191. Also, because all p-values are less than  $\alpha = 0.05$ , there is convincing evidence that engaging in these baseline risk assessments is not independent from being likely to participate in the risky COVID-19 activities. Results are detailed in Table 2 below.

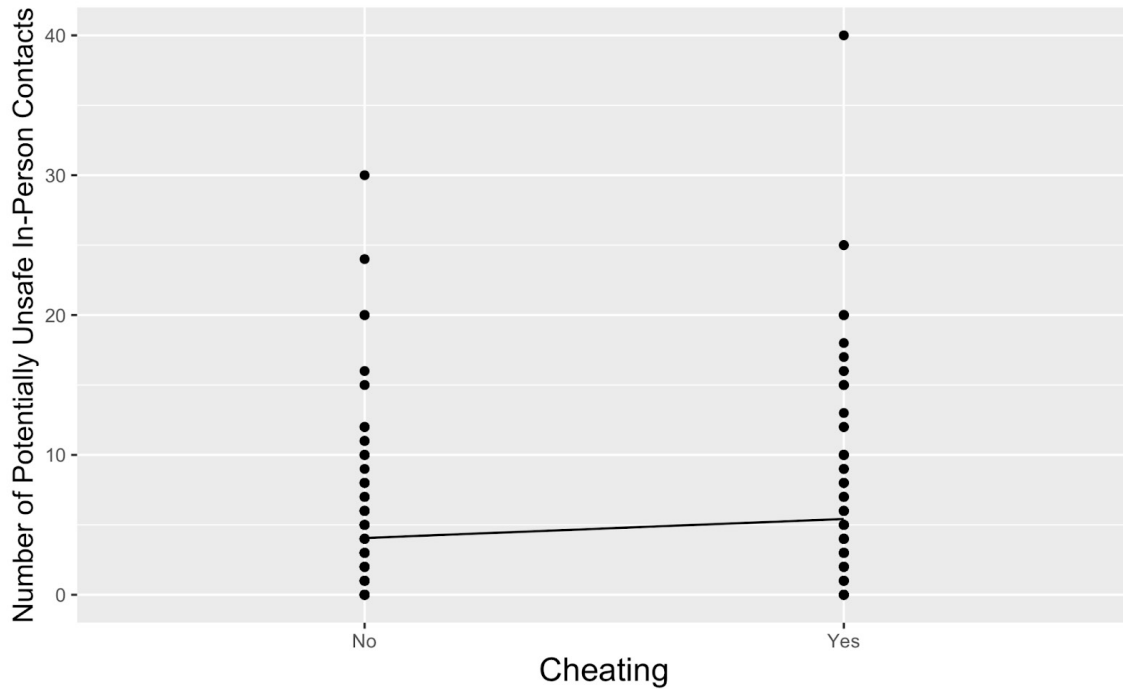
**Table 2**  
**Multinomial Logistic Regression Outputs**

	Board a plane right now if you had free tickets to a location of your choice	Host or attend parties	Shop at an indoor mall	Eat at a restaurant indoors	Play contact sports with your team
Cheating	Coef: 0.652 $p = 1.73e-04$	Coef: 0.668 $p = 1.73e-04$	Coef: 0.709 $p = 4.97e-05$	Coef: 0.729 $p = 3.02e-05$	Coef: 0.504 $p = 3.69e-03$
Underage Drinking	Coef: 1.191 $p = 7.81e-08$	Coef: 1.027 $p = 2.89e-06$	Coef: 0.584 $p = 5.36e-03$	Coef: 0.908 $p = 1.26e-05$	Coef: 0.979 $p = 5.00e-06$
Nicotine Product Usage	Coef: 1.253 $p = 5.69e-07$	Coef: 1.000 $p = 6.33e-05$	Coef: 0.750 $p = 2.59e-03$	Coef: 0.765 $p = 1.22e-03$	Coef: 1.000 $p = 4.44e-05$

## Hypothesis 2

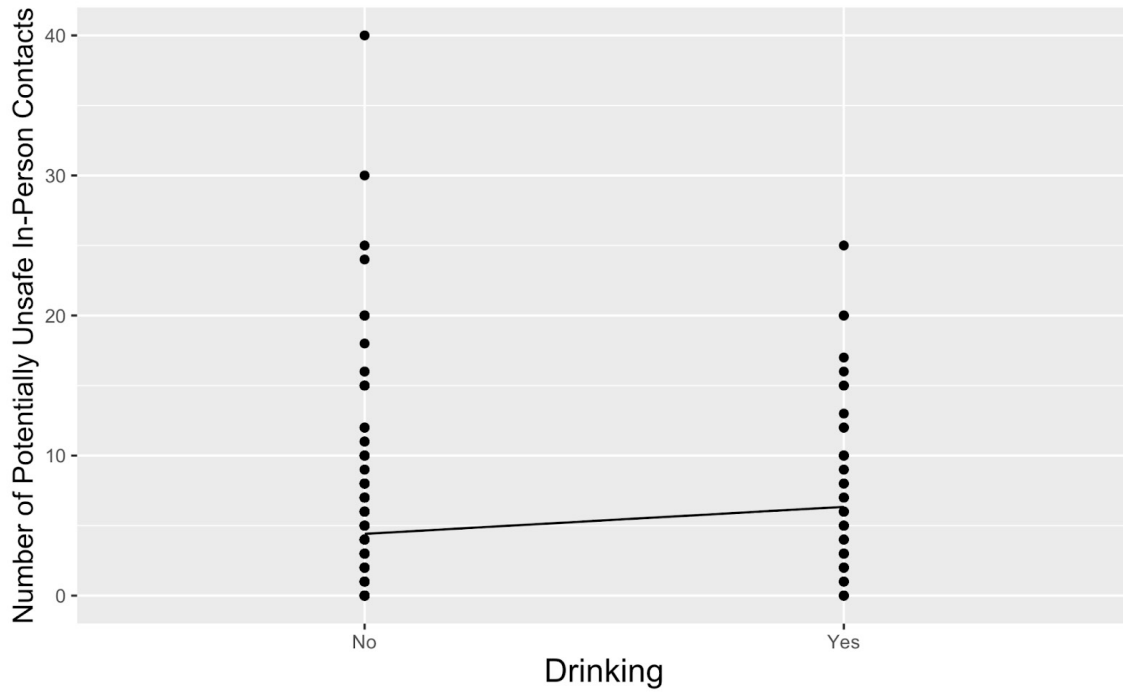
It was hypothesized that after taking pre-pandemic risk assessments, current social-distancing measures, COVID-19 risk-taking hypotheticals, residence location, and gender into account, engagement in baseline risk-taking measures would positively predict the number of potentially unsafe in-person interactions during the government mandated stay-at-home order. A series of vertical dot plots were created to analyze and determine whether or not respondents' "Yes" responses to these baseline risk assessments yielded a higher average number of potentially unsafe contacts. The hypothesis was supported, with the mean number of potentially unsafe contacts greater for respondents indicating "Yes" to participating in each baseline risk assessment than those indicating "No." This suggests that those who engaged in these higher levels of pre-pandemic risk are also exhibiting riskier behaviors during the pandemic.

The average number of potentially unsafe contacts for adolescents who hadn't cheated on a school test or assignment is 4.06 while the average for those who have is 5.42. See Figure 1 below.



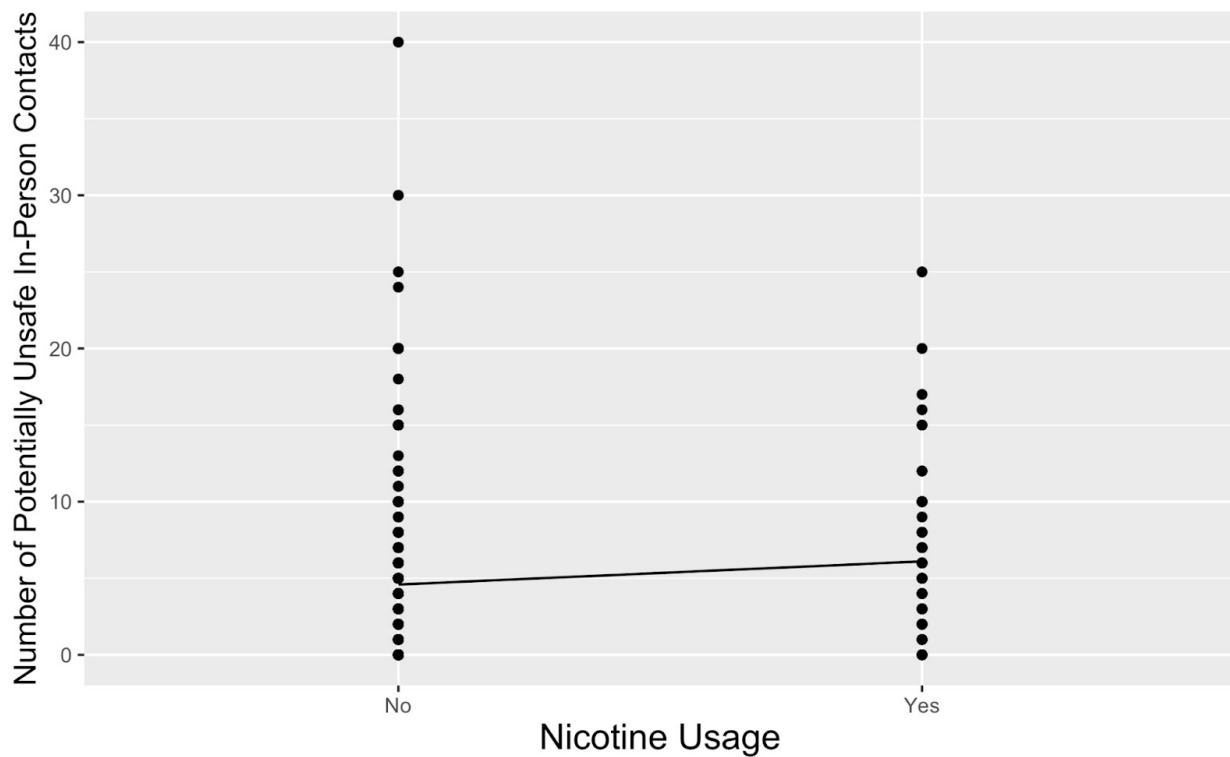
**Figure 1.** Number of potentially unsafe contacts and cheating on school tests or assignments.

The average number of potentially unsafe contacts for adolescents who hadn't engaged in underage drinking is 4.41 while the average for those who have is 6.34. See Figure 2.



**Figure 2.** Number of potentially unsafe contacts and underage drinking.

The average number of potentially unsafe contacts for adolescents who hadn't used nicotine products is 4.59 while the average for those who have is 6.11. See Figure 3.



**Figure 3.** Number of potentially unsafe contacts and nicotine product usage.

### Hypothesis 3

To examine the differences in the average ratings of respondents' perceived COVID-19 health risk to adolescents, an F test was run to determine if there was equality of variances in male and female sub samples. This failed since the ratio of variances between male and female responses was not approximately one ( $F = 0.682$ ). See Figure 4. Due to unequal variances, a Welch t-test was used with a null hypothesis of no difference in mean COVID-19 risk ratings between male and females. Because the p-value ( $p = 0.0029$ ) obtained is approximately 0.047 less than  $\alpha = 0.05$ , the null hypothesis is rejected. See Figure 5. Therefore, it can be concluded there is a difference between male and female average COVID-19 perceived risk rating, supporting the hypothesis.

```

F test to compare two variances

data:  gender_risk_female$X.7 and gender_risk_male$X.7
F = 0.68196, num df = 266, denom df = 218, p-value = 0.002943
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.5282199 0.8775993
sample estimates:
ratio of variances
 0.6819592
    
```

**Figure 4.** F test for equality of variances between male and female samples.

```

Welch Two Sample t-test

data:  gender_risk_male$X.7 and gender_risk_female$X.7
t = -2.9596, df = 421.9, p-value = 0.003254
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.9157063 -0.1848016
sample estimates:
mean of x mean of y
 5.210046  5.760300
    
```

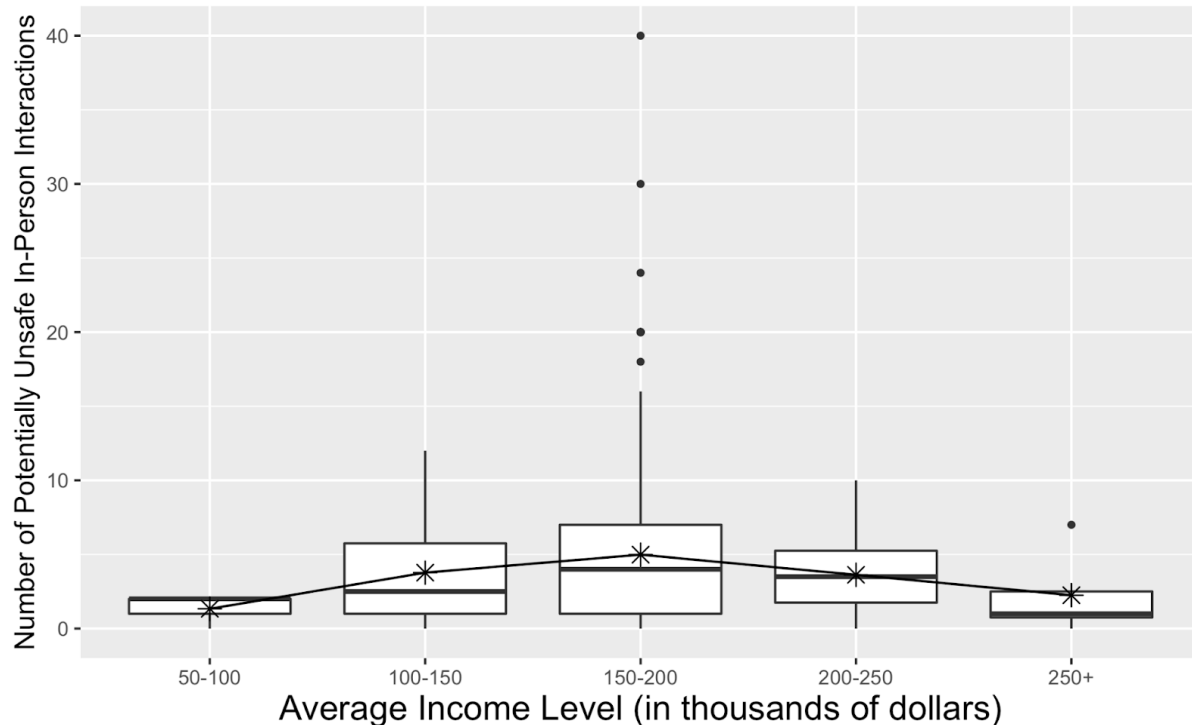
**Figure 5.** Two sample t-test for mean COVID-19 adolescent health risk rating.

Males were also found to have slightly riskier COVID-19 adolescent health risk ratings, with a mean rating of 5.21, which is lower than that of females, 5.76. Lower ratings indicate riskier adolescent behavior, with those selecting “1” believing COVID-19 presents “No risk at all” to adolescents and those selecting “10” believing COVID-19 presents “Extreme risk.”



## Hypothesis 4

It was hypothesized, based on research finding low-income and high-income adolescents to exhibit similar levels of risky problem behaviors (e.g., Racz et al., 2011), that respondents from the lowest average yearly income bracket had a similar risk level as those from the highest average income bracket. Here, risk levels are defined by how many people teens are choosing *not* to social distance from.



**Figure 6.** Number of potentially unsafe contacts and average income level.

Respondents were grouped into five average income categories, based on the zip code of their primary residence. The mean number of potentially unsafe in-person interactions for each average income bracket is indicated by an asterisk. The trend line reveals similar averages for the lowest and highest income brackets, although the most affluent adolescents are slightly riskier. The 50-100 bracket has a mean of 1.33 people while the 250+ bracket has a mean of 2.25 people (Table 2). This supports the initial portion of the hypothesis.

Contrary to the belief that this similar risk level, on both the low and high income ends, would be higher than adolescents raised in middle class neighborhoods, the data reveals that the opposite is true. The average number of potentially unsafe in-person contacts for respondents who live in middle income neighborhoods, specifically indicated by the center boxplot in Figure 6, is approximately 5 people. Therefore, this hypothesis was not supported.

**Table 2**  
*Descriptive Statistics*

Average Income (in thousands of dollars)										
	<i>n</i>	Mean	SD	Min	Q1	Median	Q3	Max	Range	
50-100	3	1.33	1.15	0	1.00	2.0	2.00	2	2	
100-150	22	3.77	3.82	0	1.00	2.5	5.75	12	12	
150-200	352	4.99	5.43	0	1.00	4.0	7.00	40	40	
200-250	24	3.62	2.68	0	1.75	3.5	5.25	10	10	
250+	4	2.25	3.2	0	0.75	1.0	2.50	7	7	

## Discussions

Consistent with my first hypothesis, there is a significant, positive relationship between adolescent engagement in risky baseline activities like cheating, underage drinking, and nicotine product usage and engagement in risky COVID-19 activities. Consistent with my second hypothesis, the present findings suggest that engagement in these baseline risk activities is also positively related to the number of potentially unsafe in-person interactions during the government mandated stay-at-home order. This study demonstrates a significant difference in the mean rating of perceived COVID-19 adolescent health risks, on a scale from 1-10, between males and females. Males were found to have slightly riskier responses. Contradictory to the hypothesized association, adolescents living in middle class neighborhoods exhibited far higher risk-taking levels than those living in either low-income or high-income zip codes. The present findings suggest that adolescents are exhibiting riskier behaviors during the pandemic.

The data yielded by this survey research contributes a clearer understanding of adolescent behavior during stressful life circumstances in the current society. While previous research has focused primarily upon adolescent psychological distress, effects of the media and isolation, vaccine safety, and adolescents' reactions to the COVID-19 virus itself, there is still a lack of research regarding the adolescent mindset (Wiguna et al., 2020). There is no knowing how long COVID-19 will last or what pandemics will be presented in our future, and it's essential that we as a society can understand how adolescents — the next generation of adults — cope. Knowledge of this can help target our societal approach and provide the framework for how school policies and other measures can be altered to account for the change in mindset.

## Conclusions

With the COVID-19 pandemic becoming the norm in society over the past two years, it is essential to address how this stressful life circumstance affects adolescent decision-making, specifically risky decisions. The present study examines the adolescent mindset and decision-making behaviors both before and during the pandemic. It was determined that adolescents have in fact exhibited a riskier mindset and/or riskier behaviors during the stressful situation

of the pandemic. Findings suggest that adolescents who engaged in risky activities prior to the pandemic were more likely to engage in risks during the pandemic, which was expected. Interestingly, there is evidence that those who *didn't* engage in risky behaviors before the pandemic, such as cheating, drinking, or using nicotine products, began to exhibit quite risky behaviors during the pandemic — such as exposing themselves to potentially unsafe, in-person, contacts. Future research should be conducted to discover confounding variables and the implication of political affiliation, current parental job status, and parental rules for their adolescents. Such variables could contribute to a broader understanding of the issue at hand and provide a more complete picture of the mind of an adolescent during a stressful time period.

## Limitations

Despite the findings detailed above, there are several limitations to this research study that should be noted. First, although a fairly large sample size of over 500 was collected, upon analysis of the data, some respondents failed to give valid responses to survey questions or skipped questions altogether. Invalid responses included non-numerical answers to the number of potentially unsafe in-person contacts or non-existent zip codes, for instance. This reduced the sample size by 21 respondents, therefore, leading to an analysis of a smaller group of adolescents. Although not a drastic change in sample size, these adolescents may have presented important and interesting data that would be crucial for the analysis.

Second, because COVID-19 is a relatively new emergence in our lives, not much research has been conducted on how adolescent behavior changes during a pandemic. There is an increased collection of research, however, surrounding adolescent mental health and emotional behaviors during the COVID-19 pandemic (Wiguna, 2020). The lack of research surrounding changes in adolescent risk-taking behaviors before versus during pandemic times led me to seek out other research involving adolescent risk-taking and stressful life scenarios such as natural disasters (e.g., Racz et al., 2011).

Third, due to the nature of society when this survey was conducted, this sample is not representative of a large population. The adolescents who participated in this survey research all attend Hillsdale High School in San Mateo, CA. Despite efforts to gain a larger sample, government stay-at-home orders instigated high volumes of calls and emails, making it difficult to reach other institutions across the Bay Area. Despite this, the research with this sample is nevertheless intriguing as Hillsdale High School pulls a diverse group of students, with over 25% of students on free and reduced lunch and a wide range of demographics (Table 1).

Fourth, it should be recognized that when assessing the fourth hypothesis pertaining to student affluence and risky COVID-19 behaviors, the sub-samples for each average family income bracket — based on indicated zip code — were not relatively equal. There were 352 respondents in the center income bracket while only 3 respondents in the lowest income bracket and 4 respondents in the highest income bracket. This drastic discrepancy in respondent residential location, associated with family average income, may have altered the analysis and influenced that specific trend line pattern displayed in Figure 6.

Fifth, this survey research relied on self-report data. Due to this method of data collection, biases may have been introduced such as response bias, exaggeration, and selective memory. The survey doesn't allow for verification of accuracy, so this data is taken at face value and assumed to be truthful, in accordance with the statement at the beginning of the survey indicating respondent anonymity and a request for honest responses.

## Acknowledgements

I would like to thank my independent study advisor Principal Jeff Gilbert for his continued support of this endeavor, my AP Statistics teacher Mr. Michael McCall for teaching and guiding me, and my friend Carl Patel who worked with me to code and analyze the raw data.

## References

*Adolescents amid the COVID-19 pandemic: A prospective study of psychological functioning: Child and adolescent psychiatry and mental health.* Adolescents amid the COVID-19 pandemic: a prospective study of psychological functioning | Child and Adolescent Psychiatry and Mental Health. (n.d.). Retrieved February 12, 2022, from <https://rdcu.be/cGRZp>

Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., Sandhu, R., & Sharma, S. (2013). *Maturation of the adolescent brain.* Neuropsychiatric disease and treatment. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3621648/>

Johnson, S. B., Dariotis, J. K., & Wang, C. (2012, August). *Adolescent risk taking under stressed and nonstressed conditions: Conservative, calculating, and impulsive types.* The Journal of adolescent health : official publication of the Society for Adolescent Medicine. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3428028/>

Journal of child and family studies. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3614372/>

Korn, L., & Davidovitch, N. (2016, August 29). *The profile of academic offenders: Features of students who admit to academic dishonesty.* Medical science monitor : international medical journal of experimental and clinical research. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5013979/>

Racz, S. J., McMahon, R. J., & Luthar, S. S. (2011, February 1). *Risky behavior in affluent youth: Examining the co-occurrence and consequences of multiple problem behaviors.*

Romeo, R. D. (2013, April). *The teenage brain: The stress response and the adolescent brain.* Current directions in psychological science. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4274618/>

Steinberg, L. (2008, March). *A social neuroscience perspective on adolescent risk-taking.* Developmental review : DR. Retrieved February 12, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2396566/>

Steinberg, L. D. (2015). *Age of opportunity: Lessons from the new science of adolescence.* Mariner Books.

*The impact of covid-19 on the mental health of adolescents and Youth.* UNICEF. (n.d.). Retrieved February 12, 2022, from <https://www.unicef.org/lac/en/impact-covid-19-mental-health-adolescents-and-youth>

Wiguna, T., Anindyajati, G., Kaligis, F., Ismail, R. I., Minayati, K., Hanafi, E., Murtani, B. J., Wigantara, N. A., Putra, A. A., & Pradana, K. (1AD, January 1). *Brief research report on adolescent mental well-being and*

*school closures during the COVID-19 pandemic in Indonesia.* Frontiers. Retrieved February 12, 2022, from <https://www.frontiersin.org/articles/10.3389/fpsy.2020.598756/full>